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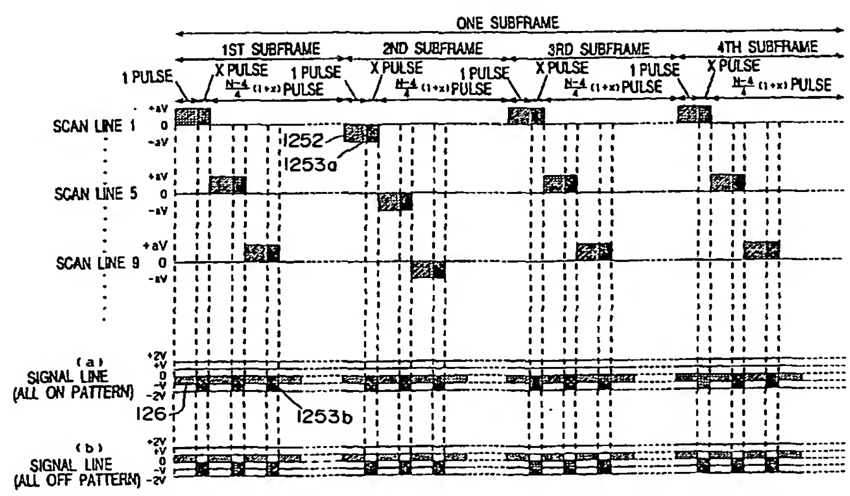
(54) Title: DISPLAY UNIT AND DRIVE SYSTEM THEREOF AND AN INFORMATION DISPLAY UNIT



(57) Abstract: In a display panel, a dummy pulse of a predetermined voltage signal is superimposed on a data signal and the dummy pulse has an amplitude much larger than the amplitude of the data signal, and thus a signal waveform applied to a light modulation layer such as LC layer is changed to a high frequency wave. The applying position of the dummy pulse is varied according to each color of R, G and B, or varied according to frame or field. By performing a MLS drive with the dummy pulse superimposed on the data signal, the amplitude difference between the selection signal and the data signal can be reduced. Thus, a common driver IC and a segment driver IC can be formed as one semiconductor chip to be placed on one side, constructing a three side free type.

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sealed off with sealing resin from the liquid crystal layer. The sealing resin had a convex structure and it was about 4 to 5 µm thick. The convex section was the same thickness as the liquid crystal layer. It was possible to make the convex section from this seal resin at the same time when making substrate boards 11 and 12. The convex section 1634 seal resin is made when boards 11 and 12 are being pressed. (See Fig. 7.) This has a large effect when making boards 11 and 12 from resin. A cost reduction and time saving becomes possible when the resin section is made at the same time as the boards. The dot convex section 1634 of the display region section is made at the same time as the boards. The convex section 1634 is made in the space next to the pixels. An effect is exhibited in the convex section 1634 liquid crystal layer 1631 according to the thickness of the film.

Normally resin or glass (or a substitute) beads are scattered in the display region. This is because the thickness of the liquid crystal layer 1631 is predetermined for certain places. These beads have been replaced by convex section 1634 of boards 11 and 12. (See Fig. 7.) Boards 11 and 12 are made from resin. The convex section 1634 is pressed etc. from resin. Convex section 1634 is placed between pixel electrodes 1633 and 1632. The dispersal of the beads is not necessary because of the thickness of the liquid crystal film 14 in Fig. 7 is a low temperature polysilicon driver circuit.

One is not limited to making the convex section 1634 from resin and beads. Usually part of the resin convex section is left as it is. The liquid crystal section (pixel section) is pressed and gouged. The uneven section 1634 is made at the same time as the board. First the level board is made and when it is reheated then the uneven 1636 is made.

The mosaic color filter is made by directly applying color to the board. Pigments applied by ink-jet printing or painted on colors are left to permeate the board. The board is then dried in a high temperature dryer. The surface is then coated with materials like UV resin, or with the inorganic silicon oxides or nitrates. Also the photogravure, offset and spinner printing techniques can be used. Using the technique in a similar way, the color filter can be formed through the semiconductor pattern technique. As well the color filter, the above technique can be directly used to make the black matrix (BM). The black matrix is colored with black, dark colors, or adjusted light complimentary colors. The concave section of the board surface is made in relation to the board surface pixels. A color filter, BM, or TFT is built into the concave section. Ideally the surface should be coated with acrylic resin. The merit of such a structure is that the surface of the pixel electrode is leveled improving the alignment of the liquid crystal molecules.

The conductor polymer causes the board surface resin to get electrical conductive properties. The pixel electrode or the reverse electrode is made directly onto the board. A hole is made in the board. Electronic parts such as capacitors are inserted into the hole. Then a thinner board becomes possible.

A pattern of any design can be cut into surface of the board. (See *1556 in Fig. 7.) The seal opening of the liquid crystal is sealed by melting the* resin on boards 11 and 12. The resin of surrounding area of the board is melted and sealed to prevent water entering the organic EL display.

Forming the board from resin and following the above procedures facilitates making holes in boards. Pressing them make it possible to form

into countless board shapes. Make holes in boards 11 and 12. Plug the holes with inductive resin. This makes both the front and back of the board into electricity inductive. Now the multi-layer circuit boards and both sides of boards 11 and 12 can be used. Inductive pins can be used instead of inductive resin. Connectors of electronic parts and capacitors are pushed into the hole. Capacitors, coils, and circuit wiring of the thin film inside the board are made to be electrically resistant. The multi-layer of boards 11 and 12 are use for electrical wiring. The board multi-layer is made fixing several thin boards together. More than one board (or film) layer can be colored.

Coloring and filtering can be done by applying pigments and dyes directly to the board. Serial numbers can be printed at the same time as the boards are being made. To prevent malfunctions arising from problems occurring when IC chips are irradiated, only the areas outside the display region are colored.

The display board can be colored with two different colors. This is done by applying resin board production techniques (such as injection and complexion processes). The above techniques can also be used to produce a display panel that has two different thicknesses of liquid crystal layer films. It is possible to make the display and the circuit board at the same time. The display area and driver boards can be easily changed.

To explain in detail, it is possible to make small changes to the film thickness to center of one pixel and what it surrounds. Make small quadrangular pyramid, triangular pyramid, or cone projections in boards 11 and 12 (See 1634a in Fig. 7 (b)). The liquid crystal molecules align themselves with the projections as in 1634a. The liquid crystal uses the

film and Cu foil can be thermo compressing bonded on the film suitable for the TCF tape without using adhesive bond. Other methods for the film suitable for the TCF tape besides that of applying Cu to polyimide film without adhesive bonding include the method of cast molding by superimposing melted polyimide on top of the Cu foil. Another method is to apply the Cu on top of metal film molded by sputtering on top of the polyimide film by coating or deposition. Each of these methods is fine with the method of using TCP tape that has Cu applied to the polyimide without using adhesive bond being the most preferable. Cu coated laminated sheets with no adhesive bond are used for lead pitches of less than 30 μm. Among the Cu coated laminated sheets that do not use adhesive bond, the method by which the Cu layer is molded by coating or deposition is effective for the miniaturization of the lead pitch due to the fact that this method is suited to Cu layer thinning.

A color filter is either formed or constructed on the top or bottom layer of the striped electrode. Furthermore, forming of a black matrix (referred to as BM herewith), made from chrome or black color resin, in between the color filters is advisable in order to prevent contrast reduction due to light escape from the pixels or the mixture of colors of the color filter.

The color filter is made so that it can either respond to the primary colors of yellow (Y), mazenda (M) and cynaogen (C) or red (R), green (G) and blue (B) so that it can respond to all pixels. The planar layout includes mosaic sequence, delta sequence and strip sequence.

Color filters that can be used other than the color filter made from a resin that is dyed in acrylic and gelatin include a color filter formed by a

multiple layer dielectric film and a color filter through a hologram. Another appropriate color filter is the selective reflection type composed of a layer of colestric liquid crystal. Additionally, the liquid crystal layer can be substituted by direct tinting. For example, if it is PD liquid crystal, a composition that tints the resin and/or a composition that distributes the color within the liquid crystal are two illustrations of this. Another option is to use the use the liquid crystal in the guest host mode.

Furthermore, the color filter is not limited to 3 colors. It can be a single color, two colors or even four or above. For example, a combination of six colors such as red (R), green (G), blue (B), cynaogen (C), yellow (Y), and mazenda (M). Additionally, the color filter is not limited to transmission methods. It can also be used as a reflection type formed by a multiple layer dielectric film as well as a simple reflection method.

When making a color filter with multiple layer dielectric film, the optical multiple layer film should be formed on whether the top or bottom of the striped electrodes. The color filter that has multiple dielectric layers is one which is made so that it has prismatic characteristics for a specific sphere through the laminating of multiple layers of dielectric film of both high and low refraction rates.

The Black Matrix (BM) is primarily used in order to prevent light escaping between the electrodes (striped electrodes and pixel electrodes). BM forms an isolation layer between the electrodes and striped electrodes (not displayed) and can be formed with either a metal film such as chrome (Cr) or with a resin composed of an acrylic resin with carbon or the like added to it.

Other possible materials for the film include optic-dispersing materials such as black metal like sexivalent chrome, coating compositions, materials, thin or thick film forming microscopic convexo-concaves on the surface, titanium oxide, aluminum oxide, magnesium oxide and opal glass. Additionally, not only dark or black colored materials, but also materials with tinted colors or pigments connected to complementary colors in relation to the light in which optic modulation layers modulate are acceptable. Holograms and diffraction gratings are also acceptable.

Black glass beads, black glass fiber, black resin beads or black resin fiber are used to suppress the film thickness of the modulator layer in the liquid crystal. In particular, black glass beads and black glass fiber are high in optical absorption and due to their hardness, they are preferable because of the low number of pieces dispersed in the liquid crystal layer.

Liquid crystal materials used in the liquid crystal layer include TN liquid crystal, STN liquid crystal, strong dielectric liquid crystal, strong anti-dielectric liquid crystal, guest host liquid crystal, OCB mode (Optical compensated Bend Mode) liquid crystal, smectic liquid crystal, colestric liquid crystal, IPS (In Plane Switching) mode liquid crystal and high particle dispersing liquid crystal (referred to as PD herewith). Furthermore, in the case where a movie display is not vital, the use of PD liquid crystal is preferable from the viewpoint of optical use efficiency. Also, in the case of still picture display being primarily used, the use of TN liquid crystal or STN liquid crystal is preferable.

It is possible to use TN liquid crystal in the liquid crystal layer, however STN liquid crystal is substantially better. Using liquid crystal with at

least 100 scanning electrodes and a liquid crystal dispersing torsion angle of 180 to 360 degrees in the liquid crystal layer is effective. Most preferable is a torsion angle of between 230 to280 degrees. Furthermore, it is possible to use a mixture of various publicly known varieties of liquid crystal materials for the composition of liquid crystal matter. If required, other non- liquid crystal material, color, chiral agent, and other additives can be added and used.

As shown above, in the liquid crystal cells filled with liquid crystal, deflection film, wave plates and deflecting film are also placed if required. In particular, in the present invention, the addition of such materials is suitable in the case of conducting a gradation (or tonal) display having contrast properties by means of a time-sharing drive of more than 1/100 duty as well as for the STN-type liquid crystal display arrangement that requires a torsion angle of 180 to 360 degrees. Additionally, it is also suitable for STN-type liquid crystal display arrangements for both black and white as well as color displays in which the compensating liquid crystal cells and the wave plates are laminated together in the STN-type liquid crystal cell.

Deflection plates with a resin film in which iodine is added to polyvinyl alcohol (PVA) resin is illustrated as an example. Deflection plates which use isolated pairs of polarized light are comparatively inferior in terms of use efficiency of light due to the fact that they isolate polarized light through the absorption of deflection fractions in the given axis of deflection of the incident light and those of from a different direction. Here, it is appropriate to use reflective polarizers which split the deflection by reflecting the deflecting fractions moving in the given axis direction and those going in a different direction. If configured in this way, the use efficiency of light is enhanced

through the reflective polarizers making a brighter display than the example of using deflecting plates mentioned above possible.

As a method of isolating of polarized light, other usable materials in addition to this type of deflecting plate and reflective polarizer include a combination of colestric liquid crystal layers and (1/4) λ plates; separation of reflective polarizer and polarized light transmission by using the Brewster angle; use of holograms; use of polarizer beam splitter (PBS) etc.

One or more sheets of phase film (phase plate, phase rotation method, wave plate, wave film) is placed between the polarizing plate and the substrate 11 and 12 (not illustrated). The use of polycarbonate as the wave film is preferable. The wave film turns the incident light into outgoing light and contributes to the efficient running of modulation.

Other materials that can be used as phase film include polyester resin, PVA resin, polysulphon resin, polyvinyl chloride resin, zeonex resin, acrylic resin, polystyrene resin and other organic resins or organic films. Another possible alternative is rock crystal. The preferred setting of the phase difference of one phase plate is above 50nm and below 350 nm in a uniaxial direction, or more preferable is above 80 nm and below 220 nm.

It is also possible to color part or all of the phase films or else give part or all of it diffusion functions. Again, another suitable process is to emboss the surface, or form a reflective protection film to prevent reflection (refer to Figs. 6 and 1556 or Fig. 7). Another suitable process is to bring out the benefits of improved contrast through the protection of halation or the tightening of the black pitch level in the display picture by forming an optic absorption film or light shielding film in places where no harm will be done or